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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 09/879,554
Filing Date: June 12, 2001
Appellant(s): DIBB, JAMES E.

John L. Conway
Reg. No. 48,241
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 2 February 2006 appealing from the Office action mailed 15 November 2005.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct but incomplete. A correct statement of the status of the claims is as follows:

This appeal involves claims 1-14 rejected under USC 112, first paragraph; claims 16-19 rejected under USC 102(e).

Claim 15 has been canceled.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

6154853

KEDEM

11-2000

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

1. **Claims 1-15 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement.** The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 1 includes the limitation "such that the mirrored subsystem is substituted for the failed disk drive in the redundancy group and the redundancy group is restored, when the failed disk drive contains redundancy data for the redundancy group (italicized words were amended into claim 1 on February 16, 2005)." After reviewing the specification thoroughly, the Examiner did not find any adequate written description for this amendment.
2. **Claims 16-19 are rejected under 35 U.S.C. 102(e) as being anticipated by Kedem (6,154,853).** As in claim 6, Kedem discloses a computer implemented method for handling a failed disk drive in a redundancy group of disk drives in an array of disk drives, wherein the failed disk drive is located in a failed disk drive slot that comprises creating a mirrored subsystem within the array using a temporary disk drive (element 31 of Figure 5) and the failed disk drive slot (element 34 of Figure 5) (Figures 4 and 5, Abstract, column 5: lines 5-59, column 6: lines 35-57), reconfiguring the redundancy group to consist of the disk drives of the redundancy group that have not failed

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(elements 32, 36 and 38 of Figure 5) and the mirrored subsystem (element 31 of Figure 5), such that the mirrored subsystem is substituted for the failed disk drive (element 34 of Figure 5) in the redundancy group (i.e., if element 34 of Figure 5 should fail, and if the data therein has been copied to element 31 of Figure 5 (mirrored copy), then element 31 of Figure 5 will replace the failed element 34 of Figure 5) (Figure 5, column 5: line 5-66), and reconstructing each data block of the failed disk drive and writing each reconstructed data block to the mirrored subsystem (i.e., if element 34 of Figure 5 should fail prior to copying the data therein to the spare device, the data of element 34 of Figure 5 can be reconstructed and then copied to the spare device) (Figures 4 and 5, column 5: lines 37-59).

3. As in claim 17, Kedem discloses inserting a replacement disk drive in the failed disk drive slot, copying data from the temporary disk drive (spare) to the replacement disk drive, and replacing the mirrored subsystem with the replacement disk drive after the data on the replacement disk drive matches the data on the temporary disk drive (i.e., once the data from the spare device has been written to the replaced disk (i.e., it matches) and the parity regenerated for all of the logical volumes, the spare device can be returned to an inactive state) (column 6: lines 35-57).

4. As in claim 18, Kedem discloses a disk drive array system that comprises a redundancy group comprising at least two disk drives and associated disk drive slots (elements 32, 34, 36 and 38 of Figure 3), a temporary (spare) disk drive with an associated temporary disk drive slot (elements 31, 33 and 35 of Figure 3), logic that detects a failure of one of the disk drives in the redundancy group (column 2: lines 32-

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35), logic that reconfigures the redundancy group to comprise the disk drives in the redundancy group that have not failed and a second storage array, wherein the second storage array operates as a mirrored subsystem comprising the temporary (spare) disk drive and the disk drive slot associated with the failed disk drive (Figures 4-6, column 5: lines 5-59), and logic that reconstructs the data blocks on the failed drive to the mirrored subsystem (Figures 4-6, column 5: lines 37-59).

5. As in claim 19, Kedem discloses logic that restores the redundancy group to its initial configuration, wherein a replacement disk drive replaces the failed disk drive after the temporary disk drive and a replacement drive inserted in the disk drive slot associated with the failed disk drive contain the same data (column 6: lines 35-57).

(10) Response to Argument

The main thrust of Applicant's argument is that Applicant is entitled to the interpretation that Applicant's invention reconstructs "Both user (logical) data and redundancy (e.g. parity) data" (AB page 11). However, it should be noted that terminology as argued by Applicant throughout the appeal brief is nowhere found in the originally filed specification, and, as will be shown by Examiner, is used only in an attempt to justify the insertion of new subject matter into the application.

Before addressing each specific argument, Examiner herein highlights Applicant's specification with regard to originally specified terminology:

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In the background: Referring to RAID-5, "data" is written in a stripe having "data sectors", data sectors storing "parity data" for the "other data sectors", and "lost data" is reconstructed.

Referring to RAID-3, "data" in a "data block" in a stripe consisting of "data sectors", one drive stores "parity data", and "data" reconstruction if drive fails.

Referring to RAID-1, "full data redundancy" through mirroring, restores "consistency" of data by copying data missing one drive to the other drive.

Referring to RAID-0, stripe consisting of corresponding "data sectors". "Error correction data blocks" are not created so it does not provide redundancy for the data.

Other RAID configurations have varying degrees of "data redundancy".

Referring to reconstruction, an error correction operation such as an exclusive-or on "data blocks" may be used with a corresponding "parity block".

In the summary: Each "data block" of the failed disk is reconstructed. A mirrored subsystem may be replaced by the replacement anytime after data thereon matches the data on the temporary disk drive. Examiner notes that the determination of repair is based on identical "data" between the temporary disk drive and replacement, not any such determination between either the temporary or replacement drives and the originally failed disk. Examiner further notes that there is no "restoration of redundancy" as claimed, merely a requirement that the data between the temporary and replacement drives are identical.

"Data blocks" of the failed drive are reconstructed to the mirrored subsystem. When the replacement contains "the same data" as the temporary disk drive, the redundancy group may be restored to its initial configuration. Examiner notes that it is the initial "redundancy group" configuration, not "redundancy", that is restored.

The mirrored subsystem allows for contemporaneous reconstruction and copying, efficiently restoring redundancy group to a "fully operational" configuration.

In the detailed description: Data is stored in a redundancy group in stripes that contain a plurality of "data blocks" and at least one "associated error-correction block".

Each "data block" is reconstructed. As noted above, it is the data block that is reconstructed and this data block is clearly differentiated from its associated error-correction block.

It continues reconstructing "data blocks" until reconstruction is complete. Operations of storing data to the redundancy group in the array and providing data from the redundancy group in the array continue during the reconstruction.

"The data" from disk drive D that has already been reconstructed to drive D is copied to replacement drive E. This is performed until the data on drive E is identical to the data on drive D.

Reconstruction of "the data" that was formerly on drive A continues until completed. After both reconstruction of "the data" and replacement drive insertion is complete, array repair is complete. Examiner notes that looking at figure 2, the figure as

well only refers to "reconstruct data block" in element 130 and "store data block to mirrored subsystem" in element 140.

Referring to Applicant's argument (AB page 9) that the rejection stems from "a strained and illogical construction of the term "data block" in the specification", Examiner points to page 5 wherein Applicant has specifically differentiated the use of the term "data block" from any such error-correction data (such as parity), "Data is stored in redundancy group 7 in stripes that contain a plurality of data blocks and at least one associated error-correction block." Within the original specification, Applicant consistently refers only to the reconstruction of data blocks and makes no reference to the reconstruction of "error-correction blocks" or any other such terminology as would lead one of ordinary skill in the art to the conclusion that redundancy data is restored, or as claimed, "the redundancy of the redundancy group is restored, when the failed disk drive contains redundancy data for the redundancy group".

Referring to Applicant's argument (AB page 9) "data sectors store data and the data includes redundancy data, in this case, parity data", Examiner notes that this is in reference to "data sectors" as referred to in the background of the application for RAID-5. The data sectors from the background are not referred to while relaying the inventive concept. "Data blocks" are instead referred to.

Referring to Applicant's argument (AB page 11) "Both user (logical) data and redundancy (e.g. parity) data are reconstructed to the mirrored subsystem", this is in direct contradistinction to the specification which differentiates between data blocks and

error-correction data (see page 5 of the specification). As disclosed by the specification, “data blocks” are reconstructed to a temporary disk and subsequently mirrored to a replacement disk. There is no provision within the specification for the reconstruction of “error-correction blocks”.

Referring to Applicant’s argument (page 11 AB), “When reconstruction of the data on the failed drive to the mirrored subsystem is complete, the redundancy of the redundancy group is restored”, this is the substance of Applicant’s new matter. Applicant then says “This result follows inherently since the mirrored subsystem appears to the rest of the redundancy group as if it were the failed drive.” Examiner does agree that the intent of the mirrored subsystem is to “appear” as the failed drive, but this is for, from page 7 of the specification, “The operations of storing data to the redundancy group in the array and providing data from the redundancy group in the array continue during the reconstruction.” Again, there is no provision within the specification for the reconstruction of the error-correction blocks of the failed drive.

Referring to Applicant’s argument (page 11 AB), “until physical repair of the failed drive can be accomplished, the redundancy group is restored to full function”, “full function” is contrasted with the claimed restoration of redundancy. Further, Applicant supposed “For example, now either drive B or C could fail before the failed drive is physically replaced and the remaining drives could continue to supply and store data.” Examiner notes that any such condition has not been provided for in the specification, either explicitly or implicitly.

Referring to Applicant’s argument (page 12 AB), “Rather than attaching the

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ordinary, customary meaning of “each data block” to mean “all blocks containing data”, the examiner has construed data blocks to mean only blocks containing logical data”, as indicated above, Examiner’s interpretation is based entirely on Applicant’s specification. Further, the differentiation of user data and parity data is a typical distinction in the art, as reflected in both Applicant’s specification and the applied reference Kedem.

Referring to Applicant’s argument (page 12 AB) that “the examiner has overlooked the fact that when drive A fails, all data sectors on drive A must be reconstructed in order to be written to drive D”, Applicant’s specification states that it is the “data block” that is reconstructed, in the very passage cited by Applicant in support of this argument. Further, Applicant has obfuscated the terminology Applicant established in the specification by referring to the data block as a “data sector”. Clearly and repeatedly, Applicant has identified the reconstructed data as the “data blocks”. Data blocks are specified by Applicant as distinct from error-correction blocks and therefore, Applicant’s reference to a data sector reconstructing both user data and parity data does not reflect the bounds of Applicant’s specification’s disclosure of reconstructing data blocks.

Referring to Applicant’s argument (page 13 AB) regarding the size of the drives, no such information regarding drive size is disclosed by the specification.

Referring to Applicant’s argument (page 13 AB) “The illogical (and unintended) result is that formation of the mirrored subsystem would merely slow down drives B and C task of supplying all the data in the redundancy group”, this is merely Applicant’s conjecture. In actuality, such a system may just as easily have been constructed for the

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purpose of supplying reconstructed data rather than having to constantly re-reconstruct such data at every request, an interpretation also supported by the specification, from page 7 of the specification, "The operations of storing data to the redundancy group in the array and providing data from the redundancy group in the array continue during the reconstruction." Applicant further implies that reconstructing only the logical data would be an added task but does not appear to realize that any such disk array system would be intimately familiar with the location of respective data and parity arrangements in the form of stripes. Regardless, reconstructing parity data *in addition* to user data may also be considered an "added task".

Referring to Applicant's argument (page 13 AB) that "The ordinary meaning of "each data block of the failed drive is then reconstructed" is to reconstruct all data sectors on the failed drive", this is again not reflected in what is actually disclosed in Applicant's specification. As Examiner has pointed out above, Applicant has specifically differentiated between user data (data blocks) and redundancy data (parity blocks) in the reconstruction process. This is both the meaning as attributed in Applicant's specification as well as the ordinary meaning as used in the art, as can be seen in, for example, the applied reference Kedem.

Referring to Applicant's argument (page 14 AB) that "the application teaches when each data block, whether containing logical data or redundancy data, of the failed drive is reconstructed to the mirror, the redundancy group becomes whole again and, therefore, fully function", as Examiner has pointed out above, the specification does not teach reconstructing both data blocks and parity blocks. While the specification does

indicate that the array is again reconfigured to the redundancy group upon copying data from the temporary drive to the replacement drive in the mirror subsystem (thereby accomplishing "full function"), there is no indication in the specification that this restores redundancy, as improperly claimed.

Referring to Applicant's argument (page 14 AB) that "To conclude otherwise would lead to the illogical result that the inventor intended the interim system ... to be created for no advantage in data redundancy...", Applicant appears to be modest in the abilities of Applicant's system. As noted above, in actuality, such a system may just as easily have been constructed for the purpose of supplying reconstructed data rather than having to constantly re-reconstruct such data at every request, an interpretation also supported by the specification, from page 7 of the specification, "The operations of storing data to the redundancy group in the array and providing data from the redundancy group in the array continue during the reconstruction." Further, a mirrored subsystem provides additional redundancy in at least that it mirrors the data within the mirrored subsystem.

Referring to Applicant's argument (page 14 AB) that in "Kedem's system, this approach makes sense only because the logical volumes on all of the drives of the redundancy group are copied to mirror drives rather than just the logical volumes on the single failing drive", Applicant is only highlighting the differences between the application and Kedem. Either system still provides utility under Examiner's interpretation. Regardless, as Examiner pointed out above, Applicant's system, as originally disclosed, provides utility without the improper new matter. That the

Application and the reference were not implemented in precisely the same manner is immaterial to the fact that improper new matter has been added by Applicant.

Referring to Applicant's argument (page 16 AB) that Kedem restores redundancy with the help of $n-1$ temporary disk drives. Kedem's teachings are inapplicable to the description of the present invention in which a single spare drive restores redundancy", Applicant has not taught the restoration of *redundancy* with a single spare drive. Reading the specification, it is apparent that Applicant has only taught the restoration of user data (data blocks) to a replacement drive for the purpose of relieving the temporary disk of the burden of singly housing reconstructed data, ultimately for the purpose of transitioning from a failed disk array configuration (which uses a temporary disk) to an original disk array configuration (which replaces the failed disk with a replacement disk). It is outside the realm of consideration of Applicant's specification when such parity data may be restored to the system. That Applicant must rely on what "one skilled in the art would reasonably conclude the inventor intended" only further strengthens the fact that the subject matter is not present in Applicant's specification.

Referring to Applicant's argument (page 18 AB) that the rejection applied under 102 subsequently does not disclosed Applicant's redefined "data block", as pointed out above, Applicant is not entitled to this interpretation because it was not originally disclosed.

Referring to Applicant's argument (page 18 AB) that "In light of the definition of "disk drive" in the specification, "reconstructing each data block" must be construed in claim 16 as meaning reconstructing all of the data blocks, both logical and redundancy",

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as pointed out above, Applicant, in the specification, has specifically differentiated between data blocks (which are reconstructed) and error-correction data (which has no indication of being reconstructed in the specification).

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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